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CR-145997

TITLE OF INVESTIGATION : Mapping islands, reefs and shoals in the
oceans surrounding Australia.

INVESTIGATION NUMBER : 2896B

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(E76-10094) MAPPING ISLANDS, REEFS AND
SHOALS IN THE OCEANS SURROUNDING AUSTRALIA
Quarterly Report, 8 Aug. - 8 Nov. 1975
(Bureau of Mineral Resources) 4 p HC \$3.50

N76-16517

Unclas
CSCL 08B G3/43 00094

FIRST QUARTERLY REPORT

PERIOD : 8 August to 8 November, 1975

II. TECHNIQUES

The investigation is divided into four strands:-

(a) Planimetric Accuracy

Measurements of the magnitudes and patterns of distortions of the LANDSAT imagery is being undertaken on scenes for which ground control is available on reefs and islands and close to the coastline. Black-and-white positive prints, magnified to scales of 1:250,000 and film diapositives at 1:1,000,000 scale produced by the Division of National Mapping, are being used in a comparison of AMG ground co-ordinates and image co-ordinates.

Various methods for correcting the distortions, so that the imagery can be used for mapping which meets Australian map accuracy standards, are being considered.

(b) Relationship between Water Depths and Scene Reflectance Levels

It is hoped that the LANDSAT imagery will be usable, not only for mapping reefs and islands, but also for determining depths of features and of the ocean bed, to depths of 20 metres. It is proposed that this part of the investigation will be carried out with digital forms of the imagery, i.e. computer compatible tapes will provide the basic data form. Test areas are being selected on the basis of the quality of the image as indicated by the 70 mm positive transparencies, and based on the availability of ground truth.

The assistance of workers at the Research School of Physical Sciences, Australian National University, Canberra, has been arranged, for the conversion of the CCT data to a workable form, including colour screen display and hard-copy, line-map form.

(c) Identification of Oceanic Features

70 mm positive transparencies have been examined in a study of methods of identifying the various features which are of significance to charting, but which are not generally studied by investigators of land features e.g. coral, sand, vegetation on coral islands, shallow water, seaweed, wave action and rocks (both submerged and awash).

(d) Map Production Methods

Methods for converting the imagery, with distortion correction, and contoured if possible, into a map form which is suitable for distribution, have to be investigated.

III. ACCOMPLISHMENTS

Results obtained so far indicate that uncorrected imagery does not meet 1:250,000 or 1:1,000,000 Australian standards of map accuracy. However it appears that simple linear

distortion correction equations will bring the imagery within 1:1,000,000 accuracies and close to the 1:250,000 standards. More complex, polynomial, distortion-correction equations may enable the imagery to reach 1:250,000 map accuracies, but the cost/benefit of such elaborate procedures may not be warranted.

IV. SIGNIFICANT RESULTS

Comparisons of the imagery with aerial photography of areas of reefs and islands and with 1:250,000 maps of coastlines indicate that the MSS imagery depicts detail to an extent which is satisfactory for 1:250,000 mapping. As the imagery does not have some of the disadvantages of aerial photography, the former should be valuable for mapping reefs, islands and shoals.

The water discolouration problem as discussed in item VI, is significant as the discoloured water appears to occur near shallow depths, so that confusion could arise through the misinterpretation of discoloured water, when it exists, as shallow water. The effect is to be investigated further.

V. PUBLICATIONS

Nil.

VI. PROBLEMS

Comparisons of scenes of the same area taken at different times indicate that some difficulty may arise from unclear water, during the determination of water depths from the imagery grey-levels. Rarely have two scenes of the same ocean area shown good agreement in the distribution of water areas which have high reflectance levels on MSS band 4. The areas of "light coloured" water are apparently due to discolouration of the water, as they have not been accounted for by scene changes which would result from differences in tide height. As yet, no method of distinguishing unclear water from shallow water has been developed, and it may be found that accurate depth contouring is limited to areas for which the water clarity can be assured.

VII. DATA QUALITY AND DELIVERY

Despatch and receipt of data has been as follows:

<u>Despatch</u>	<u>Receipt</u>	<u>No. of scenes</u>
Aug. 8	Sept 11	15
Oct. 10	Oct. 29	15
Oct. 23	Nov. 10	3
Oct. 29	Nov. 10	4
Oct. 30	Nov. 10	32

The bulk of the imagery has been received since October 29 and this has delayed the investigation. Generally the quality of imagery is good.

The suitability of the imagery as test data for the mapping investigation has been assessed; 30 scenes cover land areas only; 15 scenes are not usable for the investigation as they contain no land area and thus have no position control.

Unfortunately, only about 20% of test site No. 2 which includes the Great Barrier Reef and would provide an excellent mapping area, has been covered by this imagery.

VIII. RECOMMENDATIONS

No changes to the investigation plan can be recommended at this stage.

IX. CONCLUSIONS

It is apparent that the LANDSAT imagery will be usable for mapping reefs and islands in the oceans around Australia. The investigation must now be concentrated on:-

- (i) correcting the image distortions in order to reach a mapping accuracy of the highest achievable standard.
- (ii) using density slicing methods to enable water depth determinations to be undertaken, so that the maps can display bathymetric contours down to a depth of approximately 20 metres, in addition to reef and island detail.